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**ANTOUN G.S.**

**ABSTRACT**

The bore bar (12) comprises a cylindrical body (16) having a first end and a tool end. A cutting tool is supported on the tool end with first and second flat surfaces formed on the body between the first end and the tool end. The flat surfaces are disposed at 90° to each other. The boring bar holder (14) has first and second flat surfaces disposed at 90° to one another engaging the flat surfaces on the boring bar. A journal member engages the boring bar with line contact on a side of the boring bar opposite the flat surfaces. The center line of the boring bar is disposed at 45 degrees from the first flat surface and 45 degrees from the second flat surface.

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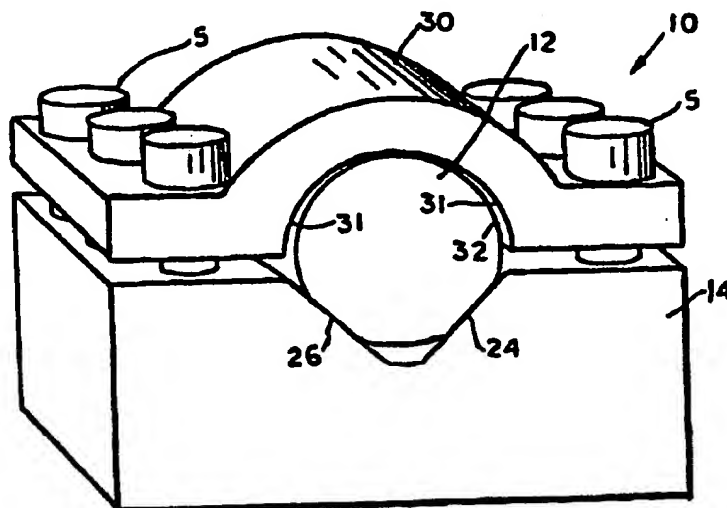
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(54) Title: BORING BAR AND HOLDER



(57) Abstract

A boring bar (12) and a boring bar holder (14). The boring bar (12) has a cylindrical body (16) having a tool end (20) with two flat surfaces (24, 26) adjacent the tool end (20) and disposed at ninety degrees to each other and at forty-five degrees to a center line of the cylindrical body (16). A journal member (28) makes line contact with the cylindrical body (16) along a line passing through the center line of the cylindrical body (16).

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## BORING BAR AND HOLDER

BACKGROUND OF THE INVENTION

10 This invention relates to boring bars, threading bars, grooving bars, holders for boring bars and the like, referred to herein as "boring bars", boring bar holders and more particularly, to a tool and holder that greatly increases rigidity due to its design. The tool always locates the cutting edge on the center of the applied forces. Three force vectors: vertical, horizontal and lateral, affect a tool in boring.

15 The current practice is to use a round boring bar holder that holds the boring bar in place with set screws. The problem is that the round bar is forced to one side of the boring bar holder and because the bar is round and the holder is round, there is contact only along a line. In some cases, 20 a flat surface is formed on the bar that causes two lines of contact. The use of set screws to hold the bar from turning in the holder also limits the torque that can be applied to the tool. When a tool, smaller than the receiving opening in the holder is used, a precision bushing is required to maintain alignment. The manufacturer generally supplies a 25 precision bushing with a round boring bar. The outside diameter of each bushing must be slightly smaller than the outside diameter of the holder and slightly larger than the inside diameter of the bar.

30 The major disadvantages of the current practice in conventional tool holders are: 1. There is a very small area of contact between the bar and the holder. 2. There is no positive stop for length. The tool must be set to its appropriate position and, a scale used to set the tool. The 35 cutting edge is frequently misaligned. 3. The direction of pressure used to hold the tool in conventional tool holders are not correct. Set screws push the tool against the side of the holder at 90 degrees to the largest force vector. 4. The alignment of the tool is changed by differences in torque applied to the set screws. 5. The total amount of torque that 40 can be applied to hold the tool in conventional tool holders is relatively small compared to the V-Bar structure of the present invention. In addition, the conventional tool holder

5      exerts a force in the wrong direction. For example, with  
three 5/16" set screws torqued at 13.3 foot-pounds equals 39.9  
foot-pounds. Six 3/8" socket head bolts torque at 48.3 foot-  
pounds at each end is equal to 289.8 foot-pounds. 6. The set  
10      screws of the conventional tool holder must be set in from the  
edge of the standard tool holder causing the actual  
unsupported length of the boring bar to be longer and  
therefore, inherently less rigid than in the present  
invention. 7. Conventional tool holders and boring bars are  
15      subject to major problems with harmonic vibration (chatter)  
due to a lack of rigidity. 8. Each size of boring bar  
requires an individual holder or bushing. Separate  
inventories must be maintained for all metric and inch sizes.  
With conventional tool holders, each time a tool size is  
20      changed, the tool holder must be replaced on the machine,  
thereby increasing set up time and increasing the potential  
for human error.

#### SUMMARY OF THE INVENTION

25      The system described in this application greatly reduces  
the problems associated with the three axis of the forces on  
the tool and provides a positive location of the tool  
radially. The boring bar is located by flat surfaces on the  
bar at a ninety degree angle to each other and forty-five  
degrees from the boring bar's center line. Journals hold the  
bar in the V formed by the flat surfaces and larger bolts  
30      eliminate any movement of the boring bar. As a result, the  
tool is capable of greater extension and is less prone to  
harmonics, commonly called chatter than in conventional tools.

35      The major advantages of applicant's V-Bar system are: 1.  
The V-Bar system aligns the boring bar and clamps on two flat  
surfaces giving it a large contact area. 2. Applicant's force  
of clamping is in the direction of the major detrimental force  
vector, greatly enhancing rigidity. 3. Applicant's system is  
self aligning with the center, but can easily and accurately  
be adjusted above or below center with the simple insertion of  
40      a standard shim under one of the flats. 4. Applicant's boring  
bar is supported and clamped to the face of the tool holder  
effectively minimizing overhang and effectively increasing the  
rigidity of the bar. 5. Applicant's holder is equipped with

5 a stop system so that the bars can not be pushed out of its  
end position and all tooling can be quickly changed. 6.  
Because applicant's tool is self-aligning and is clamped  
against flat surfaces at ninety degrees to each other, one V-  
Bar holder can hold any size of boring bar without removal of  
10 the holder from the machine or the need for bushings.  
Therefore set up time, and cost of tooling machines are  
reduced. 7. A thin sheet of elastomer can be clamped between  
applicant's V-Bar and tool holder to additionally damp  
vibration in the V-Bar system. This is possible in the V-Bar  
15 system because clamping pressure deforms the elastomer evenly  
maintaining the alignment of the centerline of the boring bar.

With the above and other objects in view, the present  
invention consists of the combination and arrangement of parts  
hereinafter more fully described, illustrated in the  
20 accompanying drawing and more particularly pointed out in the  
appended claims, it being understood that changes may be made  
in the form, size, proportions and minor details of  
construction without departing from the spirit or sacrificing  
any of the advantages of the invention.

25 BRIEF DESCRIPTION OF THE DRAWING(S)

FIGURE 1 is an isometric view of the boring bar and boring  
bar holder according to the invention.

FIGURE 2 is a front view of a boring bar and boring bar  
holder according to another embodiment of the invention.

30 FIGURE 3 is a front view of the boring bar and boring bar  
holder similar to Figure 2.

FIGURE 4 is a side view of the bar and holder similar to  
Figures 2 and 3.

35 FIGURE 5 shows a schematic view of a boring bar showing  
the force vectors encountered in normal operation.

FIGURE 6 shows a lateral cross sectional view of a boring  
bar according to the invention.

FIGURE 7 is a cross sectional view taken on line 7-7 of  
Figure 8 with the boring bar removed.

40 FIGURE 8 shows a side view of a conventional boring bar  
and boring bar holder.

5                    DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

Now with more particular reference to the drawings, Figure 1 shows a combination tool 10 made up of boring bar 12 and a boring bar holder 14. Boring bar 12 has elongated generally cylindrical body 16. First flat surface 24 and second flat surface 26 are formed on the outside of boring bar 12 and extend axially thereon. First flat surface 24 and second flat surface 26 of boring bar 12 are arranged in relation to each other in the form of a "V". First flat surface 24 and second flat surface 26 of boring bar 12 are disposed at forty-five degrees to a vertical center line of boring bar 12 and disposed at ninety degrees to each other. Boring bar 12 also has cylindrical surface 32 that joins flat surfaces 24, 26.

Boring bar holder 14 has two flat surfaces disposed in "V" relation to each other which engage surfaces 24, 26 of boring bar 12 and are disposed at ninety degrees.

A suitable cutting tool 25 will be attached to tool end 20 of boring bar 12 in a conventional manner familiar to those skilled in the art. Journal member 28 has cylindrical surface 31 which engages boring bar 12. Cylindrical surface 31 of journal member 28 has a larger radius of curvature than the radius of cylindrical surface 32 of boring bar 12. Since cylindrical surface 31 has a larger radius than cylindrical surface 32, cylindrical surface 31 makes line contact with cylindrical surface 32.

Now with reference to the embodiments of the invention shown in Figures 2 and 3, tool 10 in each case is made up of boring bar 12 and boring bar holder 14.

The embodiment of the invention shown in Figures 2 and 3 have boring bar 12 having cylindrical body 16 which is generally cylindrical in cross section having first flat surface 24 and second flat surface 26 disposed at ninety degrees to each other. A suitable cutting insert will be fixed to tool end 20 in a conventional manner. Journal member 28 will be held to boring bar holder 14 by a suitable fastening means. Journal member 28 is in the form of a bar having a flat lower surface 29 which engages the cylindrical

5 body of boring bar 12 making line contact thereby exerting a force that will be transmitted evenly to surfaces 24,26, thereby holding boring bar 12 in positive alignment.

The embodiment of Figure 3 differs from Figure 2 by recess 36 in clamping bars 30. Recess 36 has flat bottom 34 which  
10 engages cylindrical surface 32 of boring bar 12.

The embodiment shown in Figure 4, is a side view of boring bar 12 and boring bar holder 14. Boring bar 12 may be generally cylindrical like the boring bar in the other embodiments.

15 Boring bar 12 is supported on boring bar holder 14. Cutting tool 25 is supported on tool end 20 of boring bar 12. First end 18 of boring bar 12 is received in boring bar holder 14 and clamping bars 30 are held by studs 33 to clamp boring bar 12 in boring bar holder 14. Boring bar 12 will be made  
20 with flat surfaces like first flat surface 24 and second flat surface 26 in the embodiment of Figures 1, 2 and 3. Clamping bars 30 will be made like clamping bars 30 in Figures 1, 2 and 3.

Figure 5 shows a diagram of forces x, y and z on boring  
25 bar 12 showing vector in the x, y and z planes. The vertical vector x is considerably greater than y and z vectors.

Figure 6 shows a cross sectional view of the boring bar according to the invention showing flat surfaces 25,26 being disposed t ninety degrees to each other.

30 Figure 7 shows boring bar holder 14 of a type according to the prior art having cylindrical bore 46 to receive cylindrical boring bar 12 with boring bar holder 14 clamped on boring bar 12 by suitable set screw 42.

Figure 8 shows a side view of boring bar holder 14  
35 according to the invention.

The foregoing specification sets forth the invention in its preferred, practical forms but the structure shown is capable of modification within a range of equivalents without departing from the invention which is to be understood is  
40 broadly novel as is commensurate with the appended claims.

5       The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A boring bar and a boring bar holder;

      said boring bar comprising a cylindrical body having a first end and a tool end;

10       a cutting tool is supported on said tool end;

      a first flat surface and a second flat surface are formed on said cylindrical body between said first end and said tool end;

      said first flat surface and said second flat surface being  
15       disposed at substantially ninety degrees to each other;

      said boring bar holder having a first flat surface and a second flat surface disposed at ninety degree to one another engaging said flat surfaces on said boring bar;

      a journal member engaging said boring bar with line  
20       contact on a side of said boring bar opposite said first flat surface and said second flat surface; and,

      a center line of said boring bar being disposed at forty-five degrees from said first flat surface and forty-five degrees from said second flat surface.

25

2. The boring bar and boring bar holder recited in claim 1 wherein said boring bar has a generally cylindrical surface and said journal member has a generally cylindrical surface.

30       3. The boring bar holder and boring bar recited in claim 1 wherein said journal member has a generally cylindrical body having said flat surfaces adjacent one end thereof.

35       4. A boring bar and boring bar holder comprising said boring bar holder having a "V" shaped groove therein;

      said groove being defined by a first flat surface and a second flat surface disposed at substantially ninety degrees to each other;

40       said boring bar having two elongated flat surfaces disposed at substantially ninety degrees to each other forming said "V" shaped groove;



5        said flat surfaces on said boring bar engaging said flat  
surfaces on said boring bar holder and a journal member  
engaging said boring bar with substantially line contact on a  
radial line passing through said center of said boring bar and  
through a central axis of said "V" shaped groove by said flat  
10       surfaces toward said flat surface on said boring bar support;  
force means for urging said bar toward said boring bar  
support; and,  
said flat surfaces on said boring bar support.

15       5. The boring bar and boring bar holder recited in claim  
4 wherein said journal member has a cylindrical surface having  
a radius of curvature greater than the radius of curvature of  
said cylindrical body of said boring bar.

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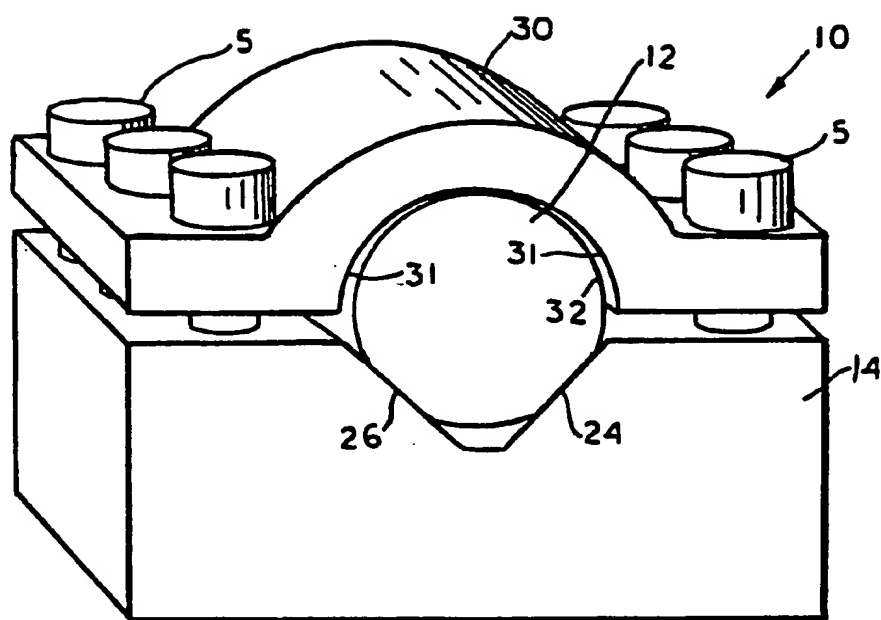


FIG. 1

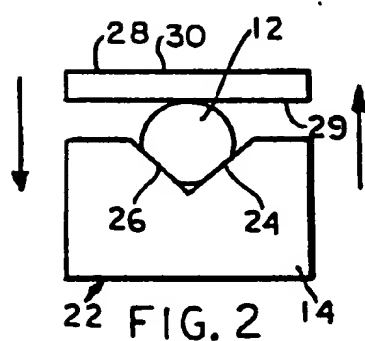


FIG. 2

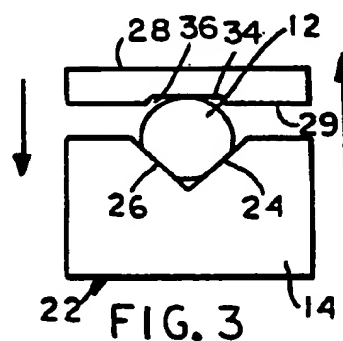


FIG. 3

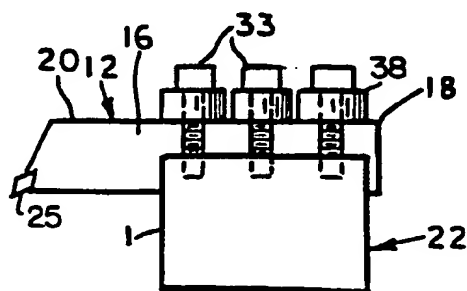
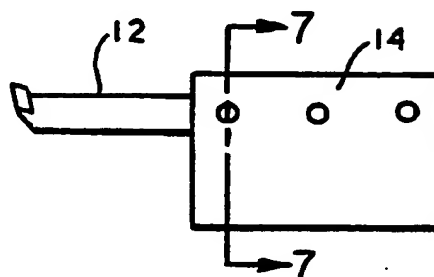
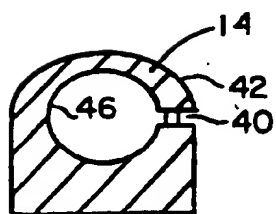
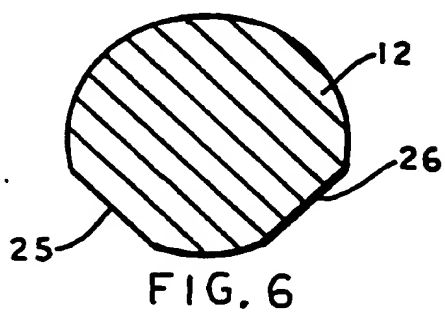
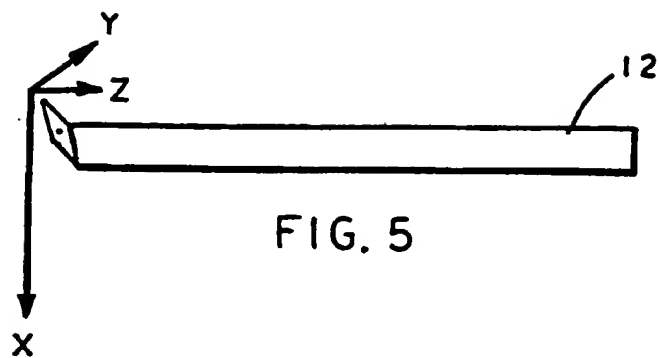


FIG. 4

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**SUBSTITUTE SHEET (RULE 26)**

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US95/06828

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(6) : B23B 29/02, 29/06 US CL : 82/158, 160, 161 According to International Patent Classification (IPC) or to both national classification and IPC														
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) U.S. : 82/158, 160, 161  Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)														
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>														
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.												
X --- Y	US, A, 577,076 (SHERMAN) 16 February 1897, See 24, fig. 1 & page 1, lines 100-105.	1 & 4 ----- 2, 3, & 5												
Y	US, A, 5,261,302 (ERICKSON ET AL) 16 November 1993, See 18a, fig. 1.	2, 3												
Y	US, A, 2,436,952 (CONKEY) 02 March 1948, See 68 & 72 in fig. 2.	5												
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.														
<table border="0"><tr><td>* Special categories of cited documents:</td><td>"T" later document published after the international filing date or priority date but not in conflict with the application but cited to underlined the principle or theory underlying the invention</td></tr><tr><td>"A" document defining the general state of the art which is not considered to be of particular relevance</td><td>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td></tr><tr><td>"E" earlier document published on or after the international filing date</td><td>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td></tr><tr><td>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td><td>"A" document member of the same patent family</td></tr><tr><td>"O" document referring to an oral disclosure, use, exhibition or other means</td><td></td></tr><tr><td>"P" document published prior to the international filing date but later than the priority date claimed</td><td></td></tr></table>			* Special categories of cited documents:	"T" later document published after the international filing date or priority date but not in conflict with the application but cited to underlined the principle or theory underlying the invention	"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	"E" earlier document published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"A" document member of the same patent family	"O" document referring to an oral disclosure, use, exhibition or other means		"P" document published prior to the international filing date but later than the priority date claimed	
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"E" earlier document published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art													
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Date of the actual completion of the international search 23 AUGUST 1995		Date of mailing of the international search report 13 SEP 1995												
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230		Authorized officer FOR MARK ROSENBAUM Telephone No. (703) 308-1148  <i>Sheila Venev</i> <i>Patent Specialist</i> <i>Group 3200</i>												